

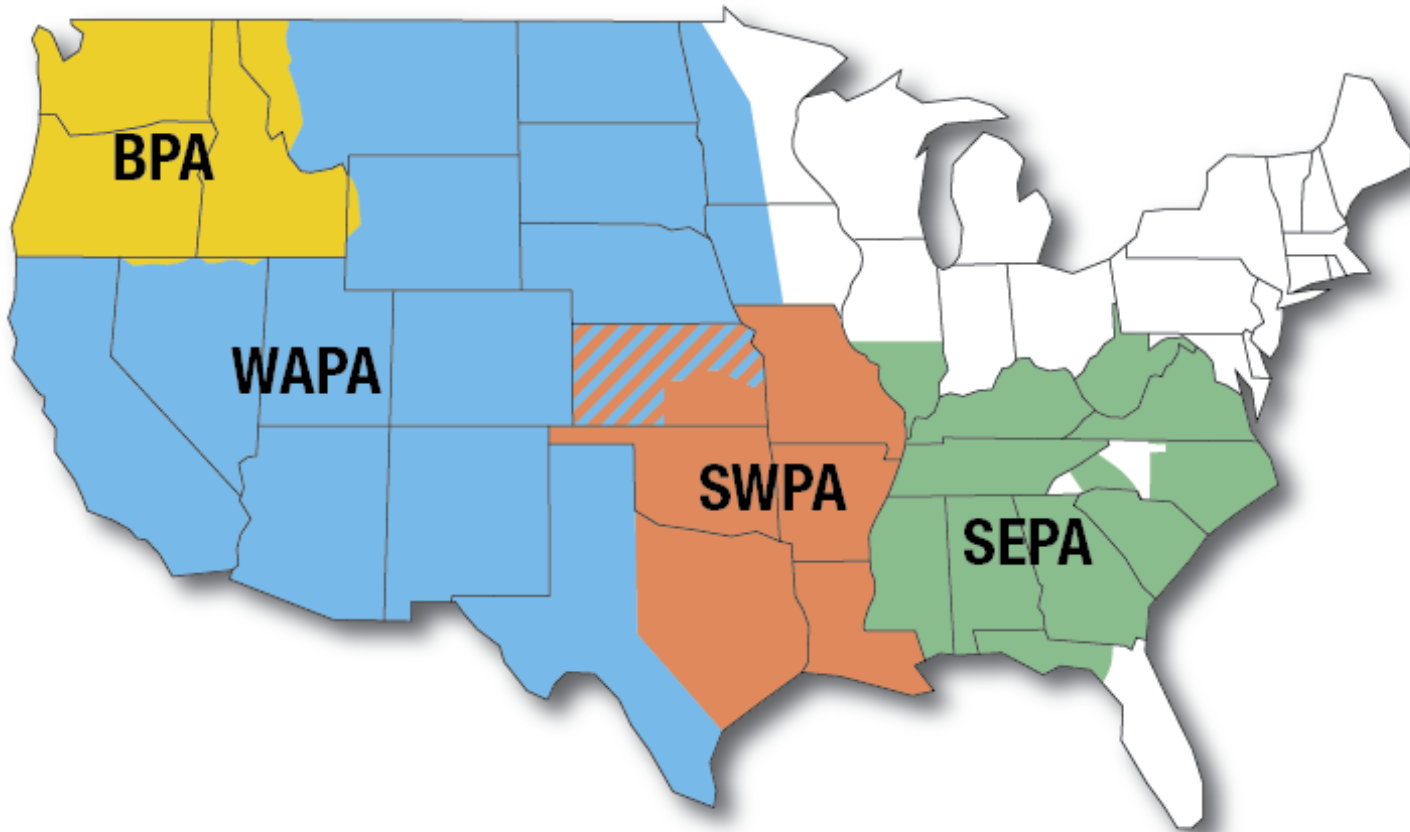
RADICAL THOUGHTS: Providing value amid a changing energy landscape

Mark A. Gabriel, Administrator and CEO

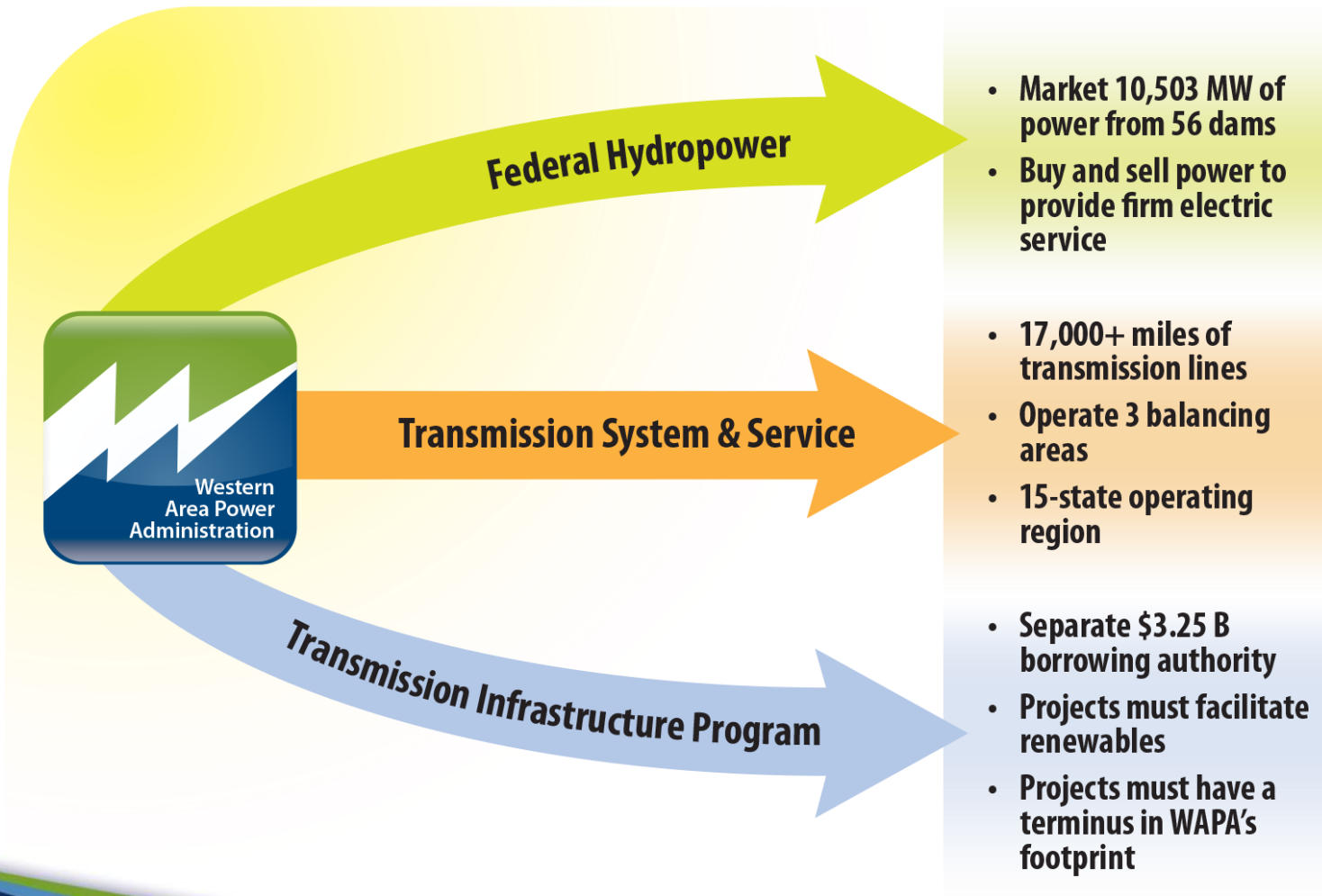
Big 10 and Friends Utility Conference

Lincoln, NE
April 30, 2018

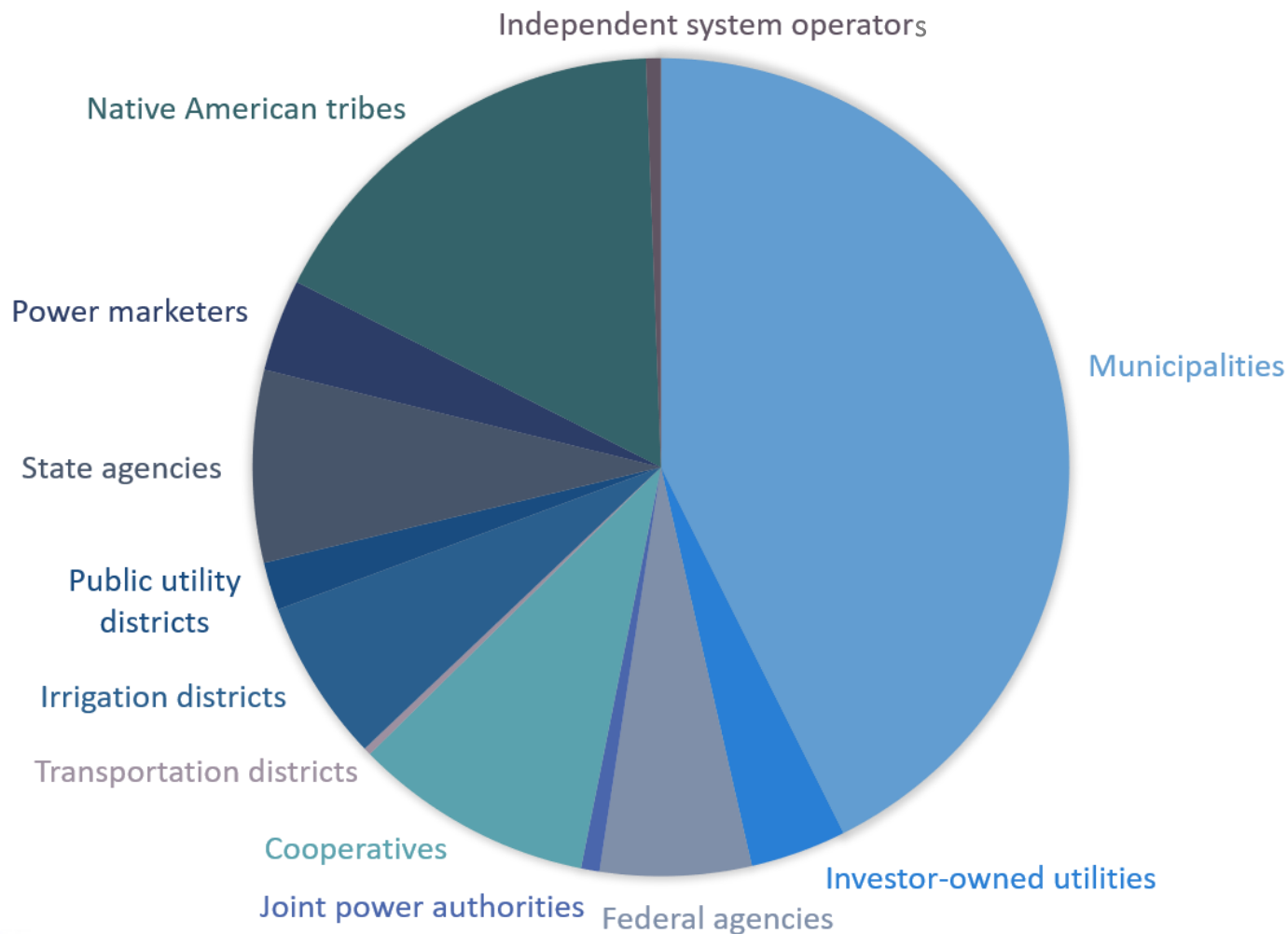
WAPA: Who we are



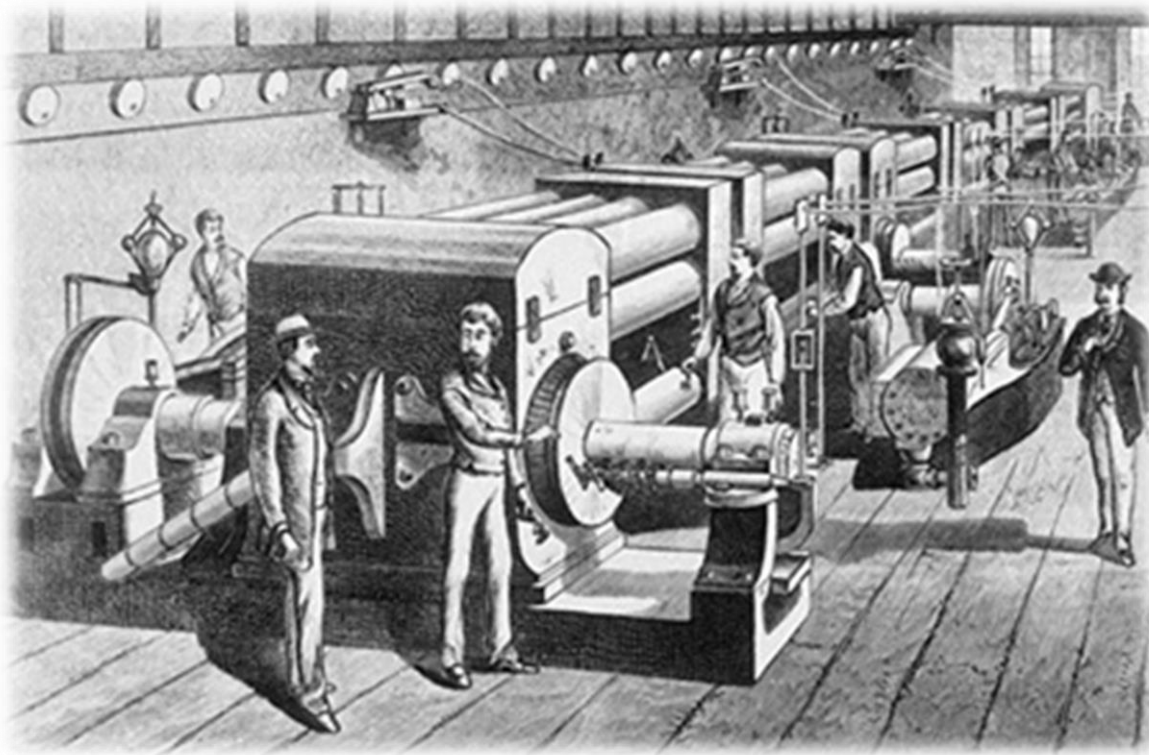
WAPA: What we do



WAPA: Who we serve



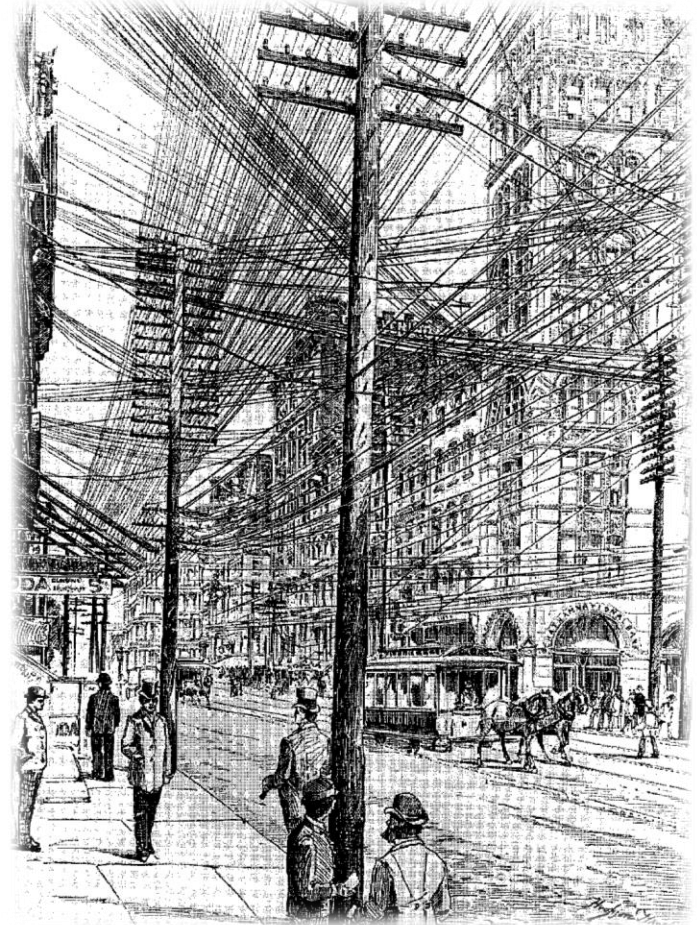
Micro-grid circa 1880



1882 First electric station built by
Edison on Pearl Street

Dot Com circa 1880: Electricity

- Industry began in support of other enterprises
 - Industrial
 - Telegraph, telephone
 - Street cars
- Wild West of the east coast
 - 20 companies providing service in NYC
 - 18 deaths in 1889



Key issues

- Cyber and physical
- Asset management
- Lifecycle management
- Capital planning
- Markets



Change brings opportunities

- Infrastructure considerations
- Increased regulation
- Intermittent resources
- Varying hydro production
- Customer-side resources
- Changing markets
- Security



Fundamental change

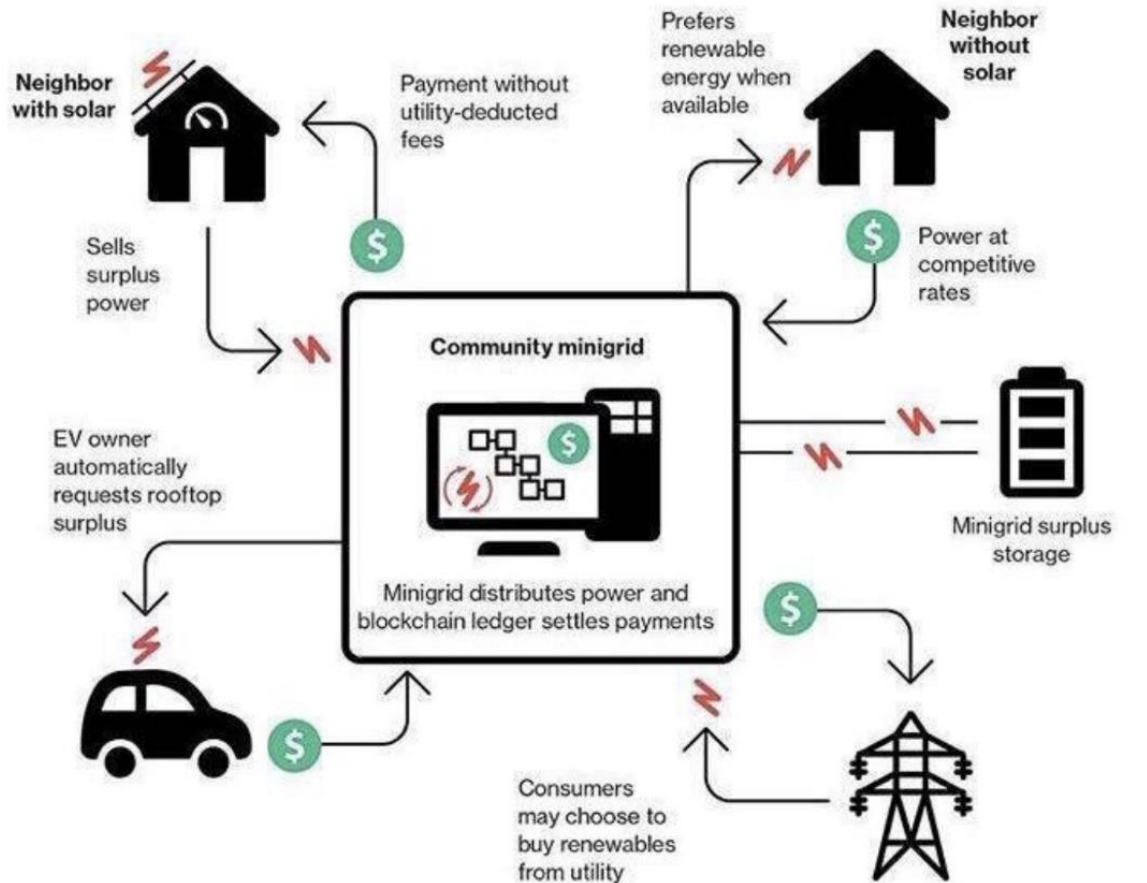
The challenge for the utility of today is not only what is real but what is perceived as real.



Societal changes



Blockchain trading



Bloomberg

The future nexus



Economic challenge

How can we manage in a Twitter–centric world?



Megatrend: Carbon/capacity conflict

We are on track for the “t***n w***k”
of expectations vs. carbon et al.



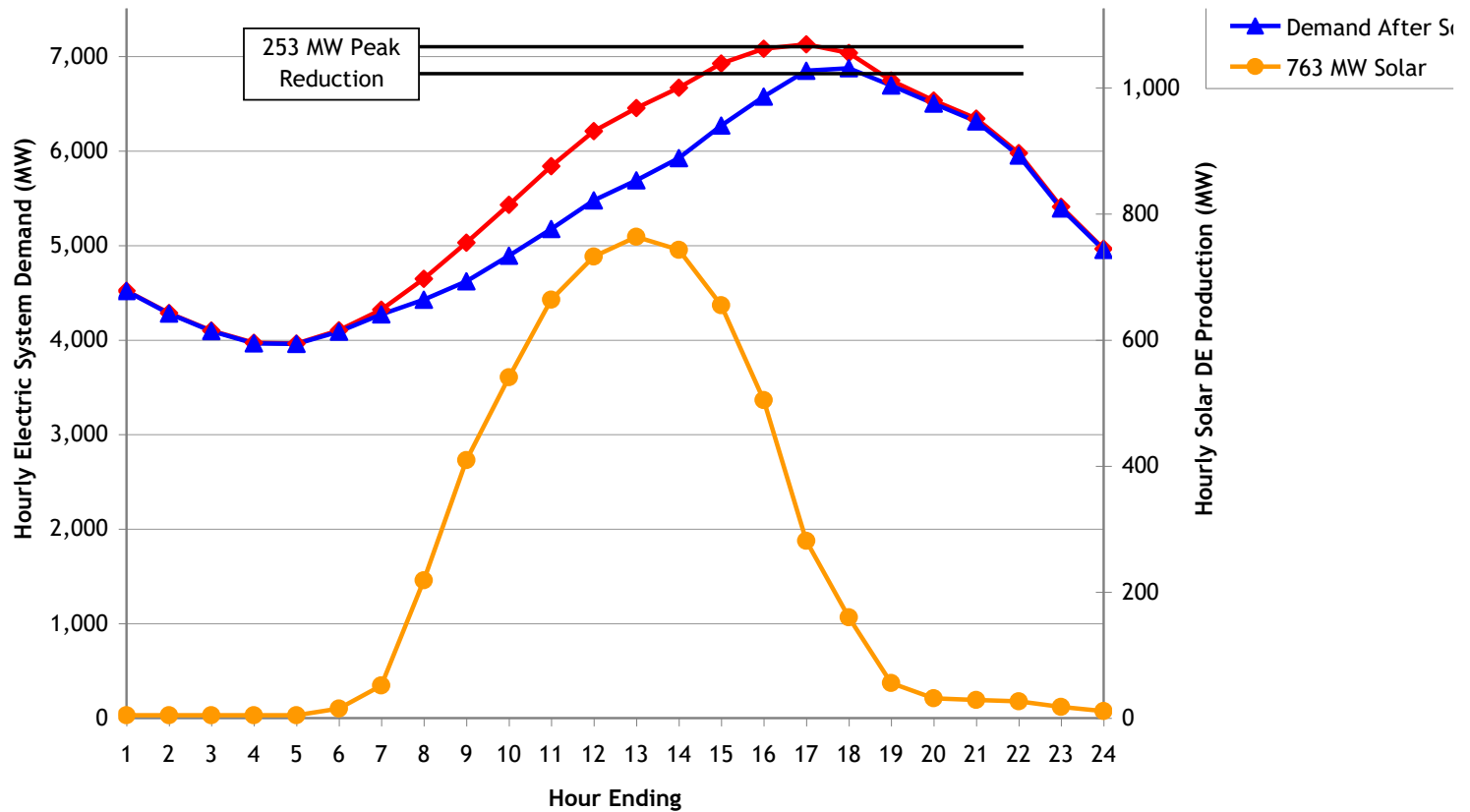
Carbon constraints/capacity conflict

- Demand for new power sources will outstrip capacity
- Demand for clean energy will outstrip the capacity
- Public perception contrasts with reality of the system
- Renewables are being promoted the only answer

Developed world
demand dead?
Developing world
demand galloping!



The solar/peak conundrum (even in Arizona)



Solar consideration



Destiny of intelligent infrastructure

- \$50 B spent in next five years in T&D
- How smart grid will change load profile is critical
- Enabler for energy efficiency and demand response
- Customer interaction is key

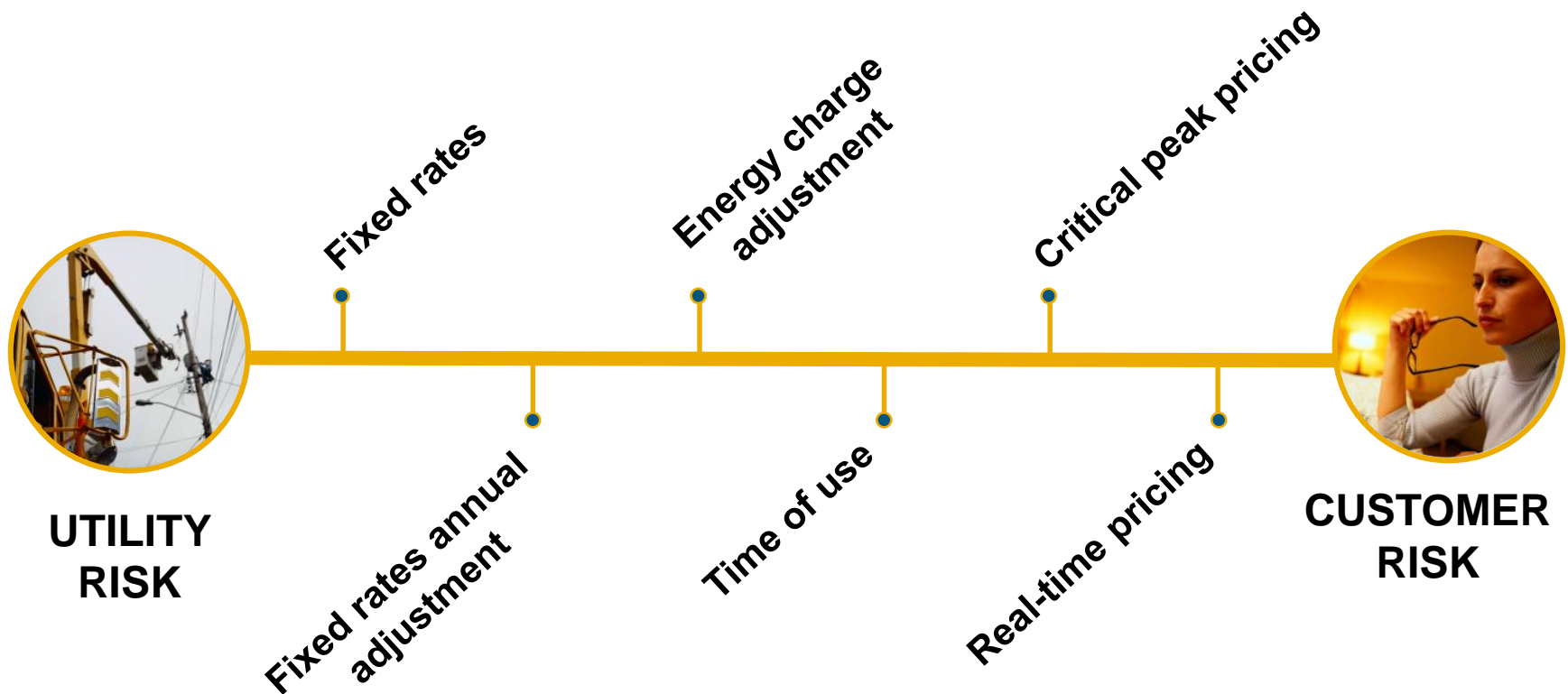


My unpopular smart grid theory

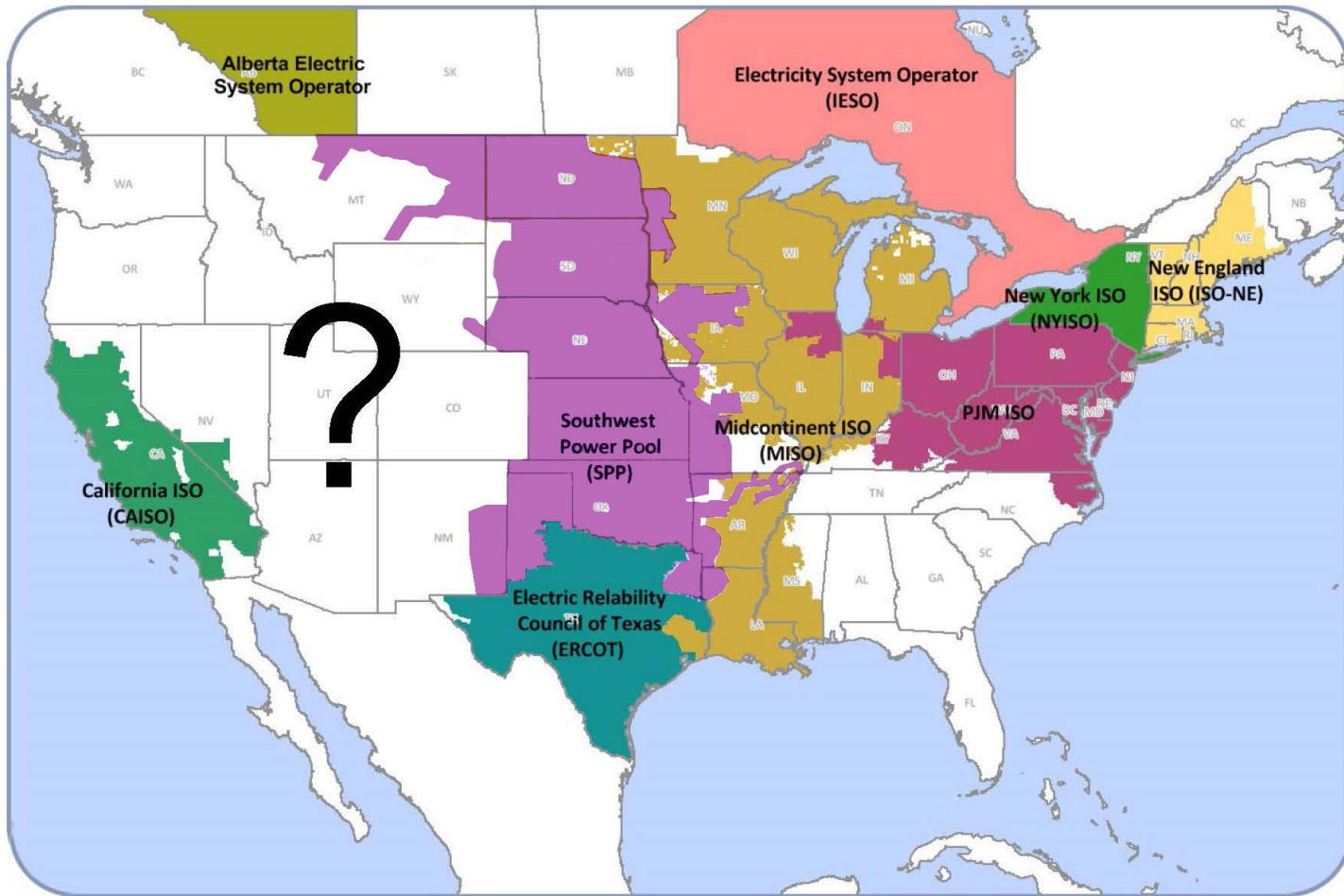
- 80% of benefits will accrue to the utility
- Consumer participation will be initially low
- Hype will hurt the efforts
- Utilities will move to smart grid because it makes sense
- Utilities will not get benefits unless they make major process changes



Customers want choice but not risk; they do not make economic choices



Markets in a hydro world

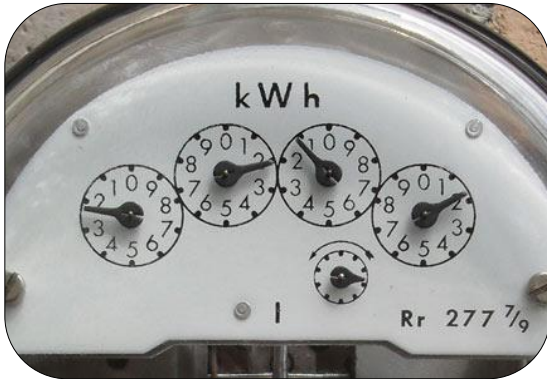


And over in Germany...

- Energiewende to eliminate coal and nuclear as a social policy
- Wholesale prices down while consumers bear the impact: 40 cents per kWh
- Blown up the utility business
- 800-900 DSOs
- 4 TSOs (owned by foreign entities)
- 1.8 million generators
- Relies on assets of other countries



Radical thoughts



The kilowatt-hour
is dead



Time-of-purchase
vs. time-of-use



All-you-can-eat
energy

Key takeaways

Partnership and innovation are key to maximizing resources and keeping the lights on



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Gavins Point Dam – Yankton, SD – Photo by Army Corps of Engineers